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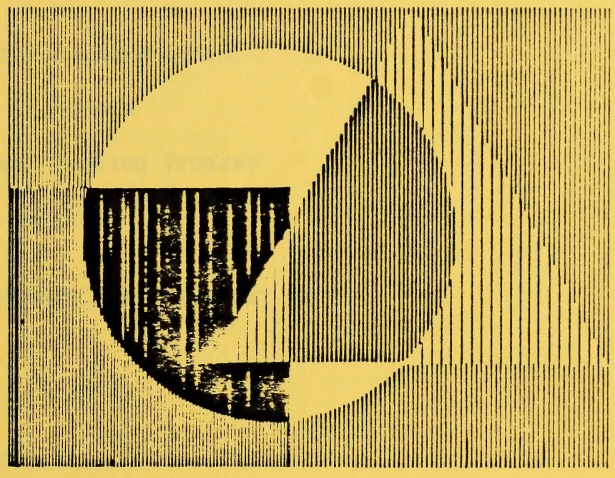
Student Achievement Testing Program Bulletin

Grade 6 Mathematics



1986-87 School Year

Alberta
EDUCATION
Student Evaluation Branch

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This bulletin contains general information about the 1986 Student Achievement Testing Program and information specific to the Grade 6 Mathematics Achievement Test. Additional copies of this bulletin may be obtained by telephoning 427-2948.

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September 1986

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PURPOSE OF THE BULLETIN

The Grade 6 Mathematics Achievement Test will be written on June 9, 1987. This bulletin provides a general description of the achievement test, an outline of the objectives to be tested, the test blueprint, and sample questions that demonstrate the nature and complexity of the test items. Attached to the bulletin is the *Grade 6 Mathematics Curriculum Specifications* (revised, 1986) which presents the specific content and objectives from which the test questions are developed.

Students should have access to the information in this bulletin, particularly to the sample questions.

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GENERAL INFORMATION

Purpose of the Achievement Testing Program

The Achievement Testing Program provides Alberta Education, school jurisdictions, and the public with information significant at the provincial and local levels about student knowledge, understanding, and skills in relation to program objectives. This program is not intended to provide information to be used for student placement or promotion.

The achievement tests are administered on a four-year cycle in four subject areas: language arts, social studies, mathematics, and science; and at three grade levels: 3, 6, and 9.

Nature of the Achievement Testing Program

The achievement tests are specific to the program of studies prescribed by the Minister of Education. Curriculum specifications for each subject area, prepared by the Curriculum Branch and the Language Services Branch of Alberta Education, identify the major content areas, the specific learning objectives within each content area, and the emphasis that each objective is to receive. The test questions reflect these curriculum specifications.

Classroom teachers from across the province are extensively involved in developing and field-testing the questions. The student responses are analysed after field-testing to determine each question's discriminating power and level of difficulty. Questions may undergo several revisions before they appear on the achievement test.

The final draft of each test is examined by the Achievement Test Review Committee that includes representatives of The Alberta Teachers' Association, the Conference of Alberta School Superintendents, Alberta's post-secondary institutions, and Alberta Education.

Students Tested

The results of the Achievement Tests are significant at the school jurisdiction level. In most school jurisdictions, total population testing is required to obtain significant results. However, in large school districts, testing with the school as a sample unit is an alternative if a board motion is forwarded to Alberta Education prior to April 1, 1987. Alberta Education will assume total population testing unless a board motion is received.

Exemptions from the Achievement Testing Program

All students who have been taught the subject being tested are expected to participate in the Achievement Testing Program. Any exceptions should be identified by the principal and approved by the superintendent of schools.

The only students who may be excused from participating are those for whom the test is inappropriate. That is, students who

1. are enrolled in an approved program that has been designed for special needs students
2. are being taught the subject that will be tested in another semester or year
3. are enrolled in an English as a Second Language program
4. are being taught the specific subject being tested (mathematics, science, or social studies) in a language other than English

Exemptions for reasons other than those outlined must be approved by the Director of the Student Evaluation Branch.

Students Receiving Instruction in French

French language arts achievement tests and French translations of the mathematics, science, and social studies achievement tests are available for grades 6 and 9 according to the schedule on page 4. School jurisdictions that intend to have their students write achievement tests in French must notify Alberta Education prior to April 1, 1987.

Administration of the Achievement Testing Program

The Achievement Testing Program is administered in accordance with *Examination Regulation 531/82* pursuant to Section 11(1)(g) of the *School Act*. The achievement tests must be administered on the scheduled dates and may not be rescheduled.

The achievement tests should remain unopened until the time of administration. Duplication of any test materials, including the test booklets and answer sheets, is expressly forbidden.

Immediately following the administration of the scheduled achievement tests, the principal must ensure that test booklets and answer sheets are forwarded to school board offices. The school board is responsible for collecting and forwarding to the Student Evaluation Branch all test materials that contain students' responses. Further details regarding procedures for returning these materials to the Branch will be issued when the achievement tests are delivered. For private schools, the Regional Offices of Alberta Education assume the responsibility to collect and forward test materials to the Student Evaluation Branch. All unused testing materials may be retained by the school jurisdiction.

Alberta Education will supervise the scoring of all achievement tests. The scoring of achievement tests by school personnel prior to returning test materials to the Student Evaluation Branch is a violation of the Examination Regulations and contrary to the intent of the Achievement Testing Program.

During 1987, the achievement tests will be administered according to the following schedule:

June 9, 1987 (Morning)

Grade 3 Science

Grade 6 Mathematics*

Grade 9 Social Studies*

In 1988, the achievement tests will be administered according to the following schedule:

June 15, 1988 (Morning)

Grade 3 Social Studies

Grade 6 Language Arts

Grade 9 Mathematics*

June 16, 1988 (Morning)

Le français à l'élémentaire - 6e année

*A French translation of this test is available. The French translation must be administered at the same time as the English version.

Reporting the Achievement Test Results

An initial report presenting provincial statistical results for each achievement test will be released in early September 1987. At this time, each jurisdiction will also receive a district profile of student achievement that parallels the provincial statistical report, as well as guidelines for interpreting the jurisdictional results in relation to provincial norms. Each school will receive results for students who wrote at the school, similar in form to the jurisdiction results.

Alberta Education will not issue individual statements of results to students; individual student profiles, however, will appear in the jurisdiction and school reports.

A more detailed report presenting an interpretation of the provincial results will be available in March 1988. This report will provide, along with statistical results, descriptive and evaluative statements about student achievement. Issues for further study will also be identified.

DESCRIPTION OF THE GRADE 6 MATHEMATICS ACHIEVEMENT TEST

General Description

The test consists of two sections. Section 1 consists of 55 questions covering numeration, operations and properties, measurement, geometry, graphing, and problem-solving strategies. Section 2 consists of five basic-fact tests in addition, subtraction, multiplication, division, and mixed operations. Each basic-fact test contains 48 questions.

The total time allotted for writing the Grade 6 Mathematics Achievement Test is 70 minutes: 60 minutes for Section 1, and two minutes for each of the five basic-fact tests in Section 2. There is a rest break between Section 1 and Section 2.

All questions are multiple-choice with four alternatives. There are two separate booklets: one for Section 1 and one for Section 2. Students will answer questions on machine-scorable answer sheets for Section 1. For basic-fact tests in Section 2, students will answer questions in the test booklets by filling in a small circle beside the correct response. There is no separate answer sheet for basic-fact tests.

Students will require HB pencils and erasers. They will also need scrap paper for Section 1.

Students may NOT use calculators while writing this test.

Content of the Test

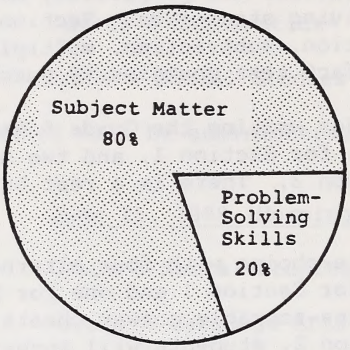
The four major components of the Grade 6 Mathematics curriculum and the emphasis that each is to receive according to the *Grade 6 Mathematics Curriculum Specifications* (revised, May 1986) form the basis for the achievement test. These four components are:

Component	Emphasis (%)
Subject Matter	60
Problem-Solving Skills	20
Psychomotor Skills	10
Attitude	10

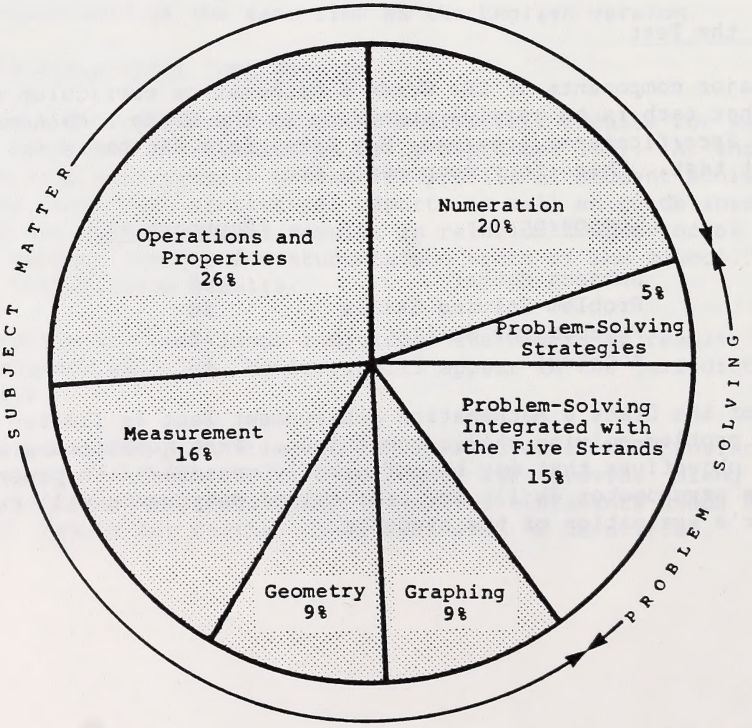
The scope of the Grade 6 Mathematics Achievement Test is limited to subject matter and problem-solving skills components. Test questions are limited to curriculum objectives that may be efficiently measured with paper and pencil tests. The psychomotor skills and attitudinal components will be reflected in the teacher's evaluation of the students.

Section 1: Subject Matter and Problem-Solving Skills

The emphasis given to the subject matter and problem-solving skills components is shown in the circle graph below.



The subject-matter component covers five strands: numeration, operations and properties, measurement, geometry, and graphing. The problem-solving skills component is divided into two parts: problem-solving integrated with subject matter, and problem-solving strategies. The emphasis given to each subject-matter strand and to each part of the problem-solving skills component is shown in the circle graph below.



Questions on subject matter measure student achievement at three cognitive levels: knowledge, comprehension, and application. An explanation of these cognitive levels is given in Appendix A.

Blueprint for the Achievement Test

The per cent emphasis of questions that test subject matter and problem-solving skills is presented in the table below.

Content	Subject Matter by Cognitive Levels			Total Subject Matter	Problem Solving	Total Test
	Knowledge	Comprehension	Application			
Numeration	10.91	5.45	3.64	20.00	3.64	23.64
Operations and Properties	1.82	16.36	7.27	25.45	3.64	29.09
Measurement	7.27	3.64	5.45	16.36	3.64	20.00
Geometry	3.64	3.64	1.82	9.09	1.82	10.91
Graphing	-	3.64	5.45	9.09	1.82	10.91
Problem-Solving Strategies	-	-	-	-	5.45	5.45
Total Section I	23.64	32.73	23.64	80.00	20.00	100.00

Section 2: Basic Facts

This section of the test consists of five timed tests. They measure student mastery of basic facts involving sums and minuends to 18, and products and dividends to 81.

The order of the basic-fact tests, the number of questions on each test, and the time allotted to write each test are presented in the table below.

Basic-Fact Tests

Operations	No. of Questions	Time in Minutes
Addition	48	2
Subtraction	48	2
Multiplication	48	2
Division	48	2
Mixed Operations	48	2

Basic-fact tests measure students' speed as well as accuracy. It is not expected that all students will be able to finish all the questions. However, students should be encouraged to do as many questions as they can.

To measure students' speed on basic-fact questions, it is essential that students answer questions in the correct sequence. The layout of the basic-fact tests has been designed to facilitate this.

Sample Questions

Sample questions that reflect the nature and complexity of the questions that will appear on the achievement test are presented on the following pages. The print size approximates the actual size that will be used on the achievement test.

Teachers are encouraged to familiarize their students with the type of questions that will appear on the achievement test by having the students work through the sample questions.

Please note that this collection of questions does not represent the test emphasis as presented in the blueprint.

SECTION I

1. Eighty-nine and forty-seven thousandths is written as

   A. 89.0047
   B. 89.047
   C. 89.470
   D. 89.47

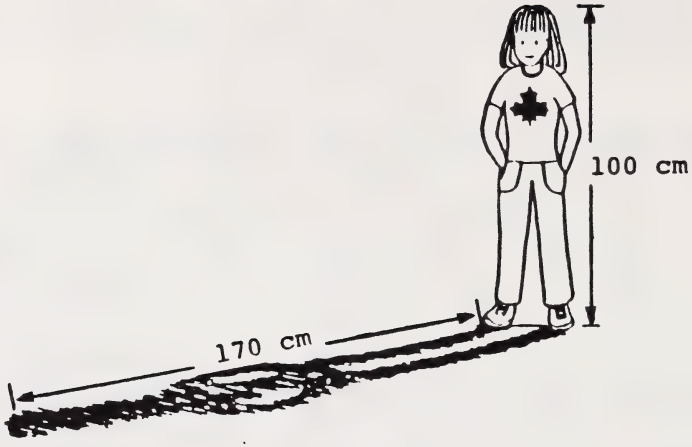
2. The group of integers that is greater than -10 and less than -5 is

   A. -9, -8, -7, -6
   B. -9, -8, -7, -6, -5, -4
   C. -10, -9, -8, -7, -6
   D. -11, -12, -13, -14, -15

3. During 5 hours of practice, Bob takes 75 shots on goal. At this rate, he would take how many shots on goal in 30 h?

   A. 300
   B. 440
   C. 450
   D. 500

4. The picture below shows Sheryl's shadow at 2 o'clock in the afternoon on a summer day.



Sheryl wants to plant a tree that will cast a 5 m shadow at about 2 o'clock in the afternoon on summer days. How tall a tree does she need?

A. 2.94 m
B. 8.5 m
C. 34 m
D. 75 m

5. Joyce did this division problem.

```
      135
57 ) 7685
     57
     198
     171   ..... line 1
      275  ..... line 2
      275  ..... line 3
      000  ..... line 4
```

In which line did the error occur?

A. Line 1
B. Line 2
C. Line 3
D. Line 4

6. 35.5 x 25 equals

A. 357.5
B. 887.5
C. 3575
D. 8875

7. Metal A melts at 1420.7°C. Metal B melts at a temperature 150.5°C higher than metal A. The temperature that metal B melts at is

A. 1270.2°C
B. 1571.2°C
C. 1581.2°C
D. 1671.2°C

8. Ann has 15 sheets of stickers.
Each sheet has 25 stickers.
She wants to give the same number of stickers to each of her 5 friends.
To find out how many stickers to give to each friend, Ann uses the equation $15 \times 25 \times 5 = n$.
Is she correct?

A. Yes.
B. No, the correct equation is $15 \times 5 \div 25 = n$.
C. No, the correct equation is $15 \times 25 \div 5 = n$.
D. No, the correct equation is $15 \times 25 - 5 = n$.

9. One digit is missing from this multiplication problem.

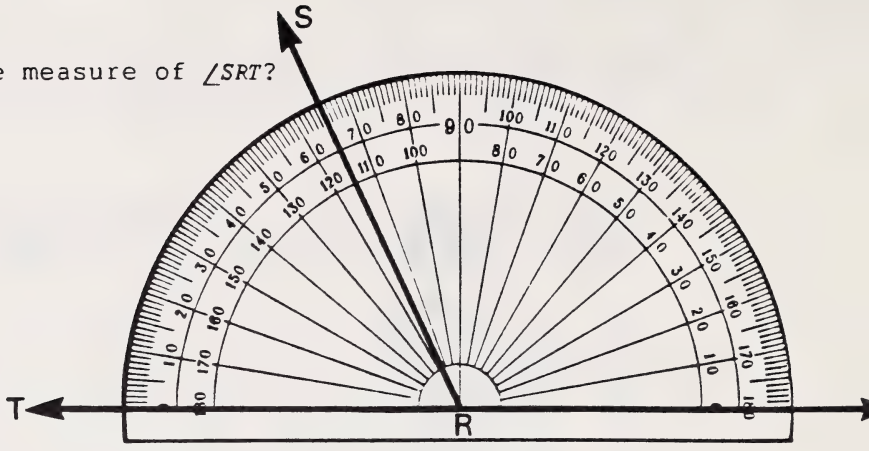
$$\begin{array}{r} 53 \\ \times\ 2\square \\ \hline \end{array}$$

If the missing digit has a value less than 5, then the product of the two numbers could be

A. 106
B. 1166
C. 1319
D. 1325

10. What is the measure of $\angle SRT$?

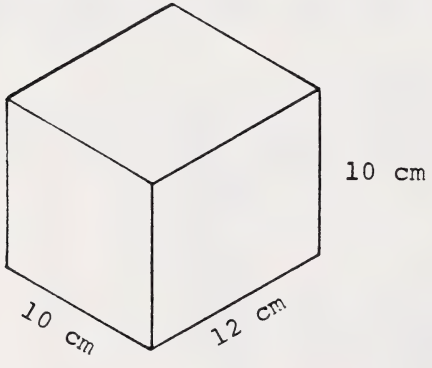
A. 115°
B. 70°
C. 65°
D. 61°

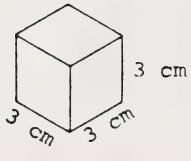


11. Mr. Simmons put a wire fence around his rectangular garden. The garden is 9 m long and 5 m wide. How many metres of fencing did he use to go around his garden once?

A. 45 m
B. 28 m
C. 23 m
D. 14 m

12. The diagram below shows the dimensions of a large box and a small box.

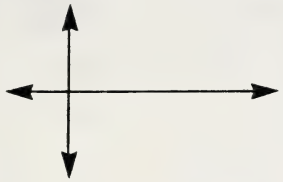


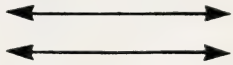


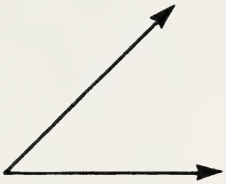
What is the greatest number of small boxes that can be stored inside the large box?

A. 44
B. 40
C. 36
D. 27

13. Which diagram below shows perpendicular lines?

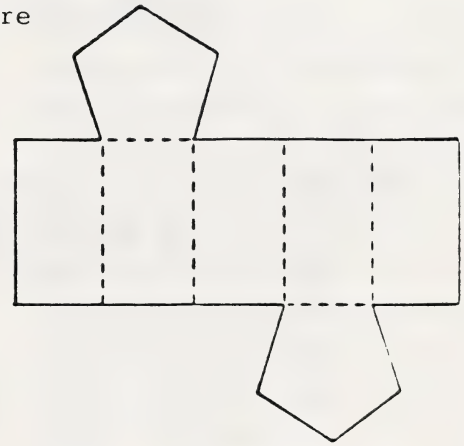
A. 

B. 

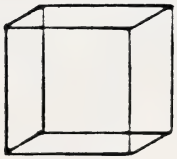
C. 

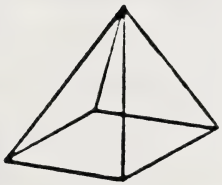
D.

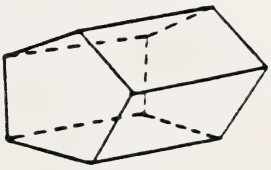
14. If the pattern at the right were cut along the solid lines and then folded along the dotted lines, it would produce



A.

B. 

C. 

D. 

15. A flip of the word at the right is SPACE

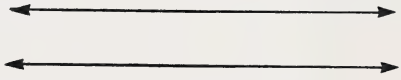
A. SPACE

B. ꓭꓠ∀Ↄ∃

C. ECAPS

D. ƎƆAԀS

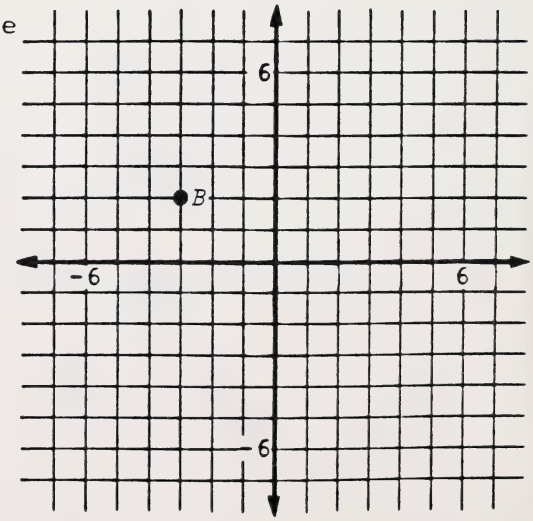
16. What is the GREATEST number of intersections that can be made by drawing two straight lines through the lines at the right?



A. 6
B. 5
C. 4
D. 3

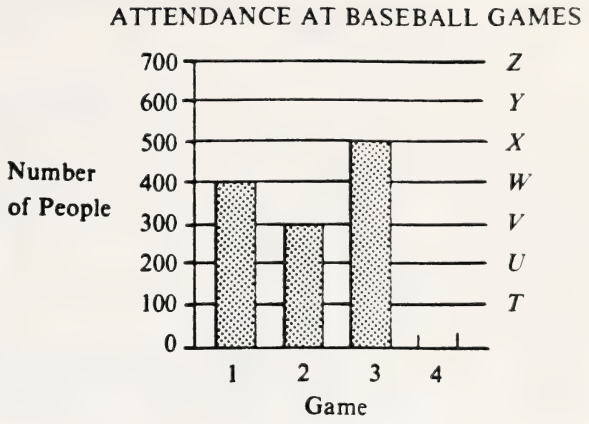
17. The co-ordinates for point B are

A. (-3, 2)
B. (-3, -2)
C. (2, -3)
D. (-2, -3)



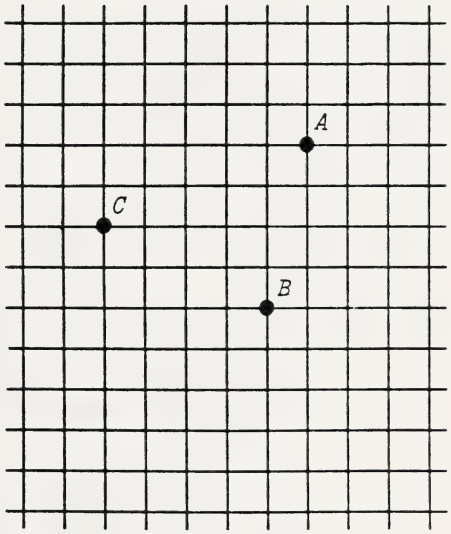
18. The bar graph at the right shows the attendance at three baseball games. If 600 people attended game 4, this number would be shown on the graph by drawing a bar to line

A. Z
B. V
C. X
D. Y



19. From the incomplete graph at the right, if the co-ordinates for point *A* are (5, 10) and for point *B* are (4, 6), what are the co-ordinates for point *C*?

A. (0, 8)
B. (1, 7)
C. (7, 1)
D. (8, 0)



20. There are 6 dotted marbles and 9 striped marbles in this bag.

How many marbles do you need to pick from the bag to be sure you get 2 marbles of the SAME kind?

A. 3
B. 7
C. 10
D. 15

21. In one season the Edmonton Eskimos played 14 games and scored a total of 315 points. In their final game the Eskimos won by 5 points. The other team scored 37 points. To find the Eskimos' score in the final game, which numbers do you need to use?

A. 5, 37
B. 37, 315
C. 5, 37, 315
D. 5, 14, 37, 315

22. Jim had 100 marbles. He lost 24 marbles to Fred and 35 to John. When he finished playing, he counted his marbles and found that he had 41 marbles left. What other way could he have found out the number of marbles he had left?

A. Add 24 and 35
B. Subtract 24 from 100
C. Subtract 35 from 100, then add 24
D. Subtract 24 and 35 from 100

SECTION II: BASIC FACTS

ADDITION

1.	2.	3.	4.
2 + 3	7 + 6	5 + 0	8 + 4
○ 3	○ 6	○ 0	○ 12
○ 4	○ 7	○ 5	○ 13
○ 5	○ 13	○ 6	○ 14
○ 6	○ 15	○ 50	○ 16

5.	6.	7.	8.
1 + 2	9 + 9	4 + 6	9 + 6
○ 1	○ 9	○ 4	○ 13
○ 2	○ 16	○ 6	○ 14
○ 3	○ 17	○ 10	○ 15
○ 12	○ 18	○ 11	○ 16

SUBTRACTION

1.	2.	3.	4.
3 - 1	10 - 4	11 - 6	17 - 8
○ 1	○ 4	○ 3	○ 6
○ 2	○ 5	○ 4	○ 7
○ 3	○ 6	○ 5	○ 8
○ 4	○ 14	○ 7	○ 9

5.	6.	7.	8.
4 - 0	6 - 2	16 - 9	7 - 7
○ 0	○ 2	○ 6	○ 0
○ 1	○ 3	○ 7	○ 1
○ 3	○ 4	○ 8	○ 7
○ 4	○ 8	○ 9	○ 14

MULTIPLICATION

1.	2.	3.	4.
3 x 2	6 x 5	7 x 6	7 x 0
○ 3	○ 5	○ 13	○ 0
○ 4	○ 6	○ 36	○ 7
○ 5	○ 30	○ 42	○ 8
○ 6	○ 35	○ 43	○ 70

5.	6.	7.	8.
4 x 4	8 x 9	1 x 5	9 x 6
○ 8	○ 8	○ 0	○ 9
○ 16	○ 9	○ 1	○ 15
○ 24	○ 17	○ 5	○ 54
○ 44	○ 72	○ 6	○ 56

DIVISION

1.	2.	3.	4.
4 ÷ 2	24 ÷ 4	42 ÷ 6	3 ÷ 1
○ 2	○ 4	○ 4	○ 1
○ 6	○ 5	○ 6	○ 2
○ 8	○ 6	○ 7	○ 3
○ 24	○ 20	○ 48	○ 4

5.	6.	7.	8.
10 ÷ 2	16 ÷ 4	45 ÷ 5	81 ÷ 9
○ 4	○ 4	○ 5	○ 8
○ 5	○ 6	○ 8	○ 9
○ 8	○ 8	○ 9	○ 11
○ 10	○ 12	○ 10	○ 72

MIXED OPERATIONS

1.	2.	3.	4.
2 + 3	4 - 0	7 x 6	10 ÷ 2
○ 3	○ 0	○ 13	○ 4
○ 4	○ 1	○ 36	○ 5
○ 5	○ 3	○ 42	○ 8
○ 6	○ 4	○ 43	○ 10

5.	6.	7.	8.
17 - 8	63 ÷ 9	8 + 4	9 x 6
○ 6	○ 7	○ 12	○ 9
○ 7	○ 9	○ 13	○ 15
○ 8	○ 18	○ 14	○ 54
○ 9	○ 54	○ 16	○ 56

Key and Question Information

Item	Key	Cognitive Level	Program Component	Curriculum Objective
1	B	Knowledge	Subject Matter	Numeration - writes whole numbers and decimals
2	A	Comprehension	Subject Matter	Numeration - identifies and orders integers
3	C	Application	Subject Matter	Numeration - uses proportional ratios
4	A	-	Problem-Solving	Numeration - identifies and uses proportional ratios Strategies - Stage 1 - interprets pictures - identifies key words - identifies given information - Stages 2 and 3 - identifies and applies relationships
5	C	Comprehension	Subject Matter	Operations and Properties - divides whole numbers using two digit whole-number divisors
6	B	Comprehension	Subject Matter	Operations and Properties - multiplies whole numbers and decimals using two digit whole-number multipliers
7	B	Application	Subject Matter	Operations and Properties - adds whole numbers and decimals
8	C	-	Problem-Solving	Operations and Properties - multiplies and divides by one and two-digit numbers Strategies - Stage 1 - identifies given information - identifies key words - Stage 4 - checks the answer - Stage 2 - chooses and applies the appropriate operations - writes a number sentence

Key and Question Information

Item	Key	Cognitive Level	Program Component	Curriculum Objective
9	B	-	Problem-Solving	Operations and Properties - multiplies whole numbers using two digit whole-number multipliers Strategies - Stage 1 - identifies given information - identifies key words - Stages 2 and 3 - guesses and checks - Stage 4 - checks the answers
10	C	Comprehension	Subject Matter	Measurement - measures an angle
11	B	Application	Subject Matter	Measurement - finds the perimeter of a rectangle
12	C	-	Problem-Solving	Measurement - finds volumes of rectangular solids Strategies - Stage 1 - interprets pictures - identifies given information - identifies key words - Stages 2 and 3 - uses a diagram - chooses and applies appropriate operations
13	A	Knowledge	Subject Matter	Geometry - identifies perpendicular lines
14	D	Comprehension	Subject Matter	Geometry - constructs a prism
15	B	Application	Subject Matter	Geometry - identifies and tests congruency using reflection (flip)
16	B	-	Problem-Solving	Geometry - identifies intersecting lines Strategies - Stage 1 - interprets pictures - identifies given information - identifies key words - Stages 2 and 3 - makes diagrams - uses manipulatives - organizes information (charts)

Key and Question Information

Item	Key	Cognitive Level	Program Component	Curriculum Objective
17	A	Comprehension	Subject Matter	Graphing - locates points in all four quadrants
18	D	Application	Subject Matter	Graphing - constructs and interprets bar graphs
19	A	-	Problem-Solving	Graphing - generates ordered pairs from given relationships Strategies - Stage 1 - interprets pictures - identifies given information - Stages 2 and 3 - identifies and applies relationships - applies patterns
20	A	-	Problem-Solving	Problem-Solving Strategies - Stage 1 - interprets pictures - identifies given information - identifies key words - Stages 2 and 3 - uses manipulatives - identifies and applies relationships - makes diagrams
21	A	-	Problem-Solving	Problem-Solving Strategies - Stage 1 - identifies given information - identifies needed informatio - identifies extraneous information
22	D	-	Problem-Solving	Problem-Solving Strategies - Stage 1 - identifies given information - identifies key words - Stage 4 - reviews the solution process - looks for alternative ways to solve the problems

APPENDIX A: EXPLANATION OF COGNITIVE LEVELS

Knowledge

- Testing for knowledge includes exercises that involve immediate recall and routine manipulation. This level represents primarily the outcomes which do not require decision-making skills or complex memory.

Comprehension

- Knowledge of concepts: A concept is an abstraction and as such requires complex decision-making.

- Translations: Comprehension involves translating from the concrete to pictorial to symbolic, or in reverse order.

Application

- Includes the ability to solve problems that involve learned skills and concepts.

- Involves the ability to recognize patterns and relationships.